Application of the Kinetic Models for Gasification of Lignite with CO_2 by Thermogravimetry

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Kinetic parameters were evaluated for lignite-CO2 gasification with K2CO3 catalyst at temperatures 600-900°C, CO2 partial pressure ranging from 20-80 kPa and 5%-15% wt catalyst loading. The effect of catalyst addition method- physical mixing and impregnation- was also determined. Results showed that carbon conversion and gasification rate increased with increasing temperature, CO2 partial pressure and catalyst loading. No significant difference was observed in the gasification rates on the basis of catalyst addition method. Kinetic parameters were evaluated using homogeneous (HM), shrinking core (SCM), random pore (RPM), modified volumetric (MVM) and extended modified volumetric (EMVM) models. Comparison showed that (1) the simple models HM and SCM could correlate catalytic gasification at higher temperatures, (2) RPM was sufficiently enough to correlate catalytic gasification, (3) much better agreement with the experimental data could be achieved with MVM and EMVM regardless of the experimental conditions varied.